AIR FORCE

QUALIFICATION TRAINING PACKAGE (AFQTP)

for

ELECTRICAL POWER PRODUCTION

(3E0X2)

MODULE 21

INTAKE AND EXHAUST SYSTEMS

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MODULE 21

INTAKE AND EXHAUST SYSTEMS

Career Field Education and Training Plan (CFETP) References from 1 May 97 version

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AIR FORCE QUALIFICATION TRAINING PACKAGES
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INTRODUCTION

Before starting this AFQTP, refer to and read the "Trainee/Trainer Guide" located on the AFCESA Web site **http://www.afcesa.af.mil/**

AFQTPs are mandatory and must be completed to fulfill task knowledge requirements on core and diamond tasks for upgrade training. ***It is important for the trainer and trainee to understand*** that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.

MANDATORY minimum upgrade requirements:

Core task:
AFQTP completion
Hands-on certification

Diamond task:
AFQTP completion
CerTest completion (80% minimum to pass)

Note: *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location*.

Put this package to use. Subject matter experts under the direction and guidance of HQ AFCESA/CEOF revised this AFQTP. If you have any recommendations for improving this document, please contact the Career Field Manager at the address below.

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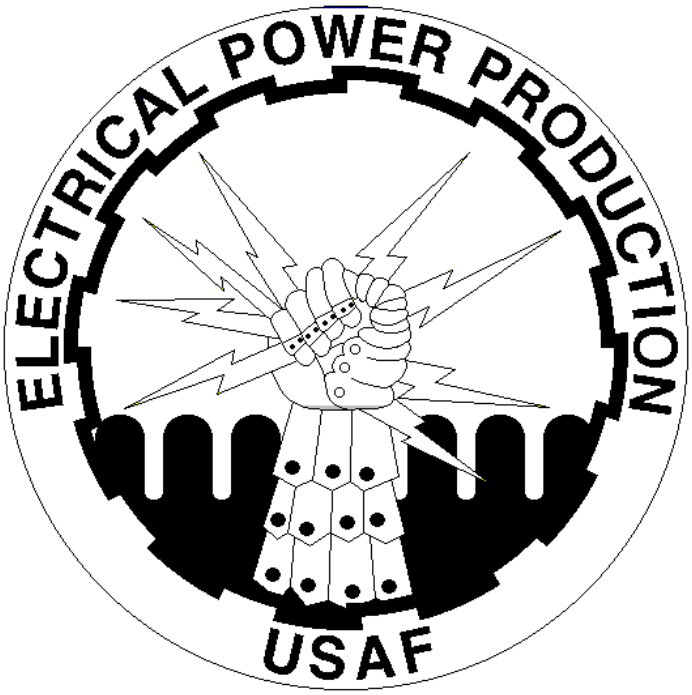


INTAKE AND EXHAUST SYSTEMS

MODULE 21 **AFQTP UNIT 2**

SERVICE (21.2)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

SERVICE INTAKE AND EXHAUST SYSTEMS

Task Training Guide

STS Reference Number/Title	21.2 Service Intake and Exhaust Systems
Training References:	• 35C2 series Technical Order • Manufacturer's Manual • Local Procedures
Prerequisites	• Possess as a minimum a, 3E032 AFSC
Equipment/Tools Required:	• General Tool Kit • Personal Safety Equipment • Applicable Technical References
Learning Objective:	• Service the components of the intake and exhaust systems on a diesel/gas engine.
Samples of Behavior:	• Trainee should be able to successfully and safely service the intake and exhaust systems on a diesel/gas engine.
Notes:	
• Any safety violation is an automatic failure. • Prior to performing any maintenance, technician MUST isolate the starting system, and apply lockout and tag-out procedures.	

SERVICE INTAKE AND EXHAUST SYSTEM

Background: The intake system starts at the inlet air filter and ends in the combustion chamber of the engine. The system is designed to provide the engine with clean air within the proper temperature range. The intake system is generally comprised of the intake air silencer, air filter, super charged system (turbocharger or blower), and associate plumbing..
The purpose of the exhaust system is to direct the exhaust gases to the atmosphere and to silence the noise by dampening the exhaust gas pressure wave. Contrary to popular belief the turbochargers only relation with the exhaust system is that it uses the exhaust gas pressure to drive it before the exhaust gases are vented to the atmosphere.

Little maintenance is required on intake and exhaust systems, provided periodic maintenance is performed. Always use the appropriate technical order or manufacturers manual when performing maintenance or replacing components.

NOTE:
Because of the different types of generators in the AF inventory, use this module in conjunction with the appropriate technical order when working on a particular type of generator

SAFETY:
REMOVE ALL JEWELRY BEFORE SERVICING THE GENERATOR INTAKE AND EXHAUST SYSTEMS TO PREVENT INJURY.

To perform the task, follow these steps:

SERVICE INTAKE SYSTEM:

Dry-Type Filters. (Figure 1)

Step 1: Remove the clamp and the filter element.
Step 2: Check the filter element for signs of blockage, holes, and damage. Replace as required
Step 3: Clean the element with low compressed air.
Step 4: When using compressed air, direct the air through the element opposite to the normal flow.
Step 5: Hold the air nozzle approximately 1 inch from the surface of the paper element and move it up and down.

Figure 1, Dry Type Air Filters

:

Oil-Bath Cleaners. (Figure 2)

Step 1: Remove the oil tray, pour out the old oil, and remove any sludge.

Step 2: Wipe the tray clean and refill it to the "level" mark with the same oil used in the engine.

Step 3: Inspect the center tube, pre-cleaner cap, and the lower filter element for damage and foreign particles.

Step 4: Remove the lower filter element and cleaned with an approved cleaning solvent.

Figure 2, Oil Bath Air Filter

Intake Silencer Screen.

Step 1: Clean screen by picking, brushing, or washing any accumulation from its surface.

Step 2: If necessary, remove the screen from the silencer and wash the oil coating off the screen mesh.

Step 3: Service the element in the screen by replacing the cotton packing or washing and pre-oil the metal wool pack (types of filter element may vary).

Intake Manifold.

Step 1: Check manifold for cracking, warping, and clogging.

Step 2: Check gaskets between the manifold and cylinder heads for leaks.

Step 3: Check manifold bolts and nuts to make sure they are tight.

Turbochargers.

Step 1: Check the turbocharger for excessive vibration during operation. When checking for vibration, it will be very apparent just by looking at it, small vibration is no reason to be alarmed, If excessive vibration is apparent, shut down the unit and determine the cause. If the engine is operating under light load, check the intake manifold for oil fouling. Remove and replace turbocharger, if necessary.

Air Piping System.

Step 1: Inspect intake screen on the air piping system for leaves and trash that can become airborne under certain condition.

Step 2: Check the flexible expansion-type joint for cracking and developing leaks at gaskets and expansion joints.

Step 3: Ensure piping clamps and brackets are secure.

SERVICE EXHAUST SYSTEM:

To perform the task, follow these steps:

Exhaust manifold.

Step 1: Check manifold for cracks and leakage.

Step 2: Ensure manifold is not warped.

Exhaust silencer.

Step 1: Check silencer components for erosion of metal parts and clogging. If the silencer is clogged, it creates back pressure on the engine.
Step : Drain moisture from drain point.

Thermocouples.

Step 1: Normally, thermocouples require very little maintenance. Check every connection points for tightness.

Step 2: Check thermocouple meter for burned or corroded wire.

Step 3: Remove and clean thermocouples with approved solvent.

Review Questions
for
Service Intake and Exhaust Systems

Question	Answer
1. The Intake system was designed to provide the engine with _____ within the proper temperature range.	a. Pure air b. Carbon monoxide c. Oxygen d. Clean air
2. Purpose of the exhaust system is to direct the exhaust gases to the atmosphere and to silence the noise by dampening the exhaust low pressure.	a. True b. False
3. What are the two types of air filters mentioned in this module?	a. Cartridge-type and dry-type b. Dry-type and oil-bath cleaner c. Oil-bath cleaner and cartridge-type d. Cartridge-type and Fram type
4. What do you look for when checking Intake and Exhaust manifolds?	a. Cracking, warping, and clogging b. Warping, clogging, and out-of-round c. Out-of-round, warping, and twisting d. Warping, twisting, and cracking
5. Use _____when cleaning a dry-type filter .	a. High compressed air b. Low compressed air c. Approved solvent d. Thinner
6. Cleaning the surface of the intake silencer screen of any accumulation consists of _____.	a. Picking, brushing, or painting b. Brushing, painting, or washing c. Picking, brushing, or washing d. Washing, brushing, or drying
7. What do you look for when inspecting exhaust silencer components?	a. Erosion of metal parts and clogging b. Shrinkage and expansion c. Expansion and clogging d. Erosion of metal parts and shrinkage
8. A clogged exhaust silencer will cause back pressure on the engine.	a. True b. False
9. What should you check for when the turbocharger is in operation?	a. High-pitched sound b. Low-pitched sound c. Excessive vibration d. Humming sound
10. The turbocharger is part of the intake system	a. True b. False
11. The thermocouple is checked for tightness of connections and burned wires.	a True b. False

INTAKE AND EXHAUST SYSTEMS

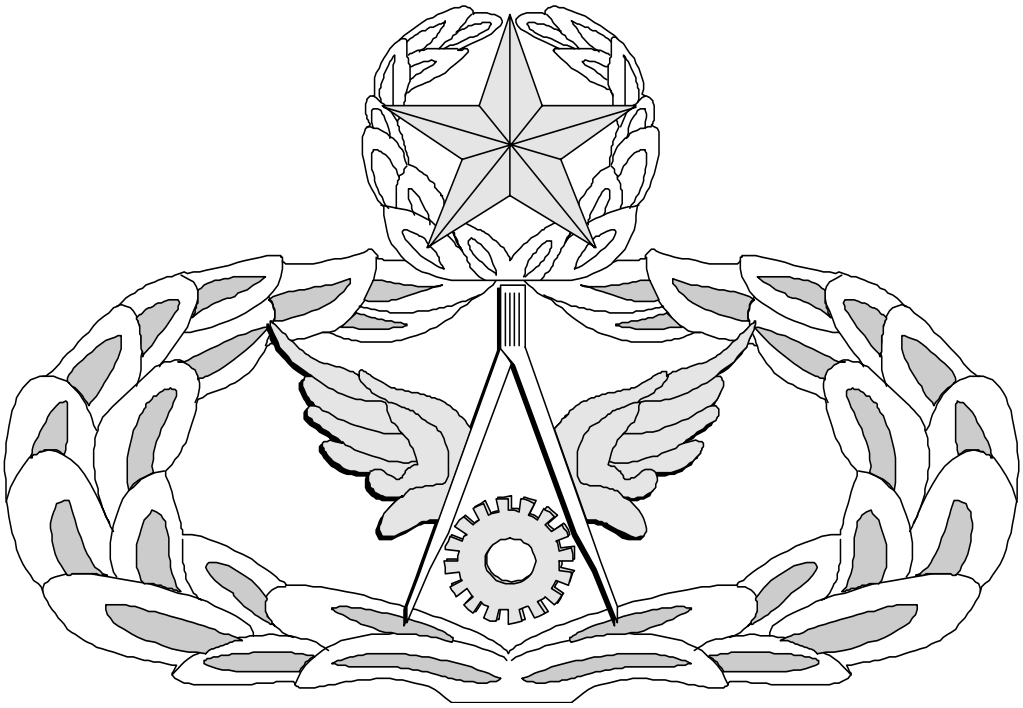
Performance Checklist		
Step:	**Yes**	**No**
1. Properly serviced dry-type filters		
2. Properly serviced oil-bath filters		
3. Properly serviced intake silencer		
4. Properly checked intake manifold		
5. Properly checked air piping system		
6. Properly checked exhaust manifold		
7. Properly checked and serviced exhaust silencer		
8. Properly checked and serviced thermocouples		
9. Properly checked turbocharger		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Air Force Civil Engineer

QUALIFICATION TRAINING PACKAGE (QTP)

ANSWER KEY



For

Power Production Systems

(3E0X2)

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SERVICE INTAKE AND EXHAUST SYSTEMS

(3E0X2-21.2)

Question	Answer
1. The Intake system was designed to provide the engine with _____ within the proper temperature range.	d. Clean air
2. Purpose of the exhaust system is to direct the exhaust gases to the atmosphere and to silence the noise by dampening the exhaust flow pressure.	b. False
3. What are the two types of air filters mentioned in this module?	b. Dry-type and oil-bath cleaner.
4. What do you look for when checking Intake and Exhaust manifolds?	a. Cracking, warping, and clogging.
5. Use _____ when cleaning a dry-type filter .	b. Low compressed air
6. Cleaning the surface of the intake silencer screen of any accumulation consists of _____.	c. Picking, brushing, or washing
7. What do you look for when inspecting exhaust silencer components?	a. Erosion of metal parts and clogging.
8. A clogged exhaust silencer will cause back pressure on the engine.	a. True
9. What should you check for when the turbocharger is in operation?	c. Excessive vibration.
10. The turbocharger is part of the intake system.	a. True
11. The thermocouple is checked for tightness of connections and the meter for burned wires.	a. True